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| APPLICATION NO. | FILING DATE | FIRST NAMED INVENTOR | ATTORNEY DOCKET NO. | CONFIRMATION NO. |
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| 10/025,322 | 12/18/2001 | Naoto Kusumoto | 07977/076003/US3130/3134D | 8044 |

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SCOTT C. HARRIS
Fish & Richardson P.C.
4350 La Jolla Village Drive, Suite 500
San Diego, CA 92122

EXAMINER

MALDONADO, JULIO J

ART UNIT PAPER NUMBER

2823

DATE MAILED: 01/14/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

| | | | | |
|------------------------------|------------------------|--|---------------------|--|
| Office Action Summary | Application No. | | Applicant(s) | |
| | 10/025,322 | | KUSUMOTO ET AL. | |
| | Examiner | | Art Unit | |
| | Julio J. Maldonado | | 2823 | |

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 18 December 2001.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-26 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-26 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on _____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
- If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) Paper No(s). _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO-1449) Paper No(s) <u>2</u> . | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Claim Rejections - 35 USC § 103

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

2. Claims 1-6 and 10-18 are rejected under 35 U.S.C. 103(a) as being unpatentable over Funai et al. (U.S. 6,162,667) in view of Hoga (U.S. 4,552,595).

Funai et al. (Figs.19A-D) in a related method to form a crystalline semiconductor film structure teach forming a semiconductor film (1302) over a substrate (1301, 1300); cleaning a surface of the semiconductor film (1302) by using HF aqueous solution; preheating said semiconductor film (1302) to form an oxide film (1303); heat treating the semiconductor film (1302) forming a crystalline semiconductor film; cleaning the surface of the crystalline semiconductor film; and applying a laser beam to said semiconductor film to improve the crystallinity of the semiconductor film (1302a), said laser beam applied at an energy density of 200 to 400 mJ/cm² (column 44, line 41 – column 45, line 48).

Funai et al. fail to teach cleaning the surface of the crystalline semiconductor film with aqueous HF and applying the laser beam in a nitrogen atmosphere. However, Hoga (Figs.2A-2B) in a related method to form a crystalline semiconductor structure teach cleaning the surface of the crystalline semiconductor film with aqueous HF forming a semiconductor film (13); and applying a laser in a nitrogen atmosphere to

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form a crystalline semiconductor film (14) (column 2, lines 53 – 61). Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention was made to apply a laser beam in a nitrogen atmosphere as taught by Hoga in the crystalline semiconductor formation method of Funai et al., since this would result in the formation of a polycrystalline region in an inert atmosphere (column 2, lines 53 – 61) with reduced impurities

3. Claims 7-9 are rejected under 35 U.S.C. 103(a) as being unpatentable over Funai et al. (U.S. 6,162,667) in view of Yoneda (U.S. 5,648,282) and Hoga (U.S. 4,552,595).

Funai et al. (Figs.19A-D) in a related method to form a crystalline semiconductor film structure teach forming a semiconductor film (1302) over a substrate (1301, 1300); cleaning a surface of the semiconductor film (1302) by using HF aqueous solution; preheating said semiconductor film (1302) in an oxygen environment to form an oxide film (1303); and applying a laser beam to said semiconductor film to form a crystalline semiconductor film (1302a), said laser beam applied at an energy density of 200 to 400 mJ/cm² (column 44, line 41 – column 45, line 48). Funai et al. fail to teach preheating said semiconductor film in an atmosphere containing oxygen and nitrogen. However, Yoneda (Fig.1A) in a related method to form an oxide layer teaches heating a semiconductor substrate (101) in an atmosphere containing oxygen and nitrogen environment to form an oxide film over a region (110) in the semiconductor substrate (101) (column 11, line 53 – column 12, line 5). Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention was made to perform the

heating process in an oxygen and nitrogen atmosphere as taught by Yoneda in the crystalline semiconductor film process of Funai et al., since this would result in the formation of an oxide layer in a purged environment (column 11, line 53 – column 12, line 5)

Funai et al. in combination with Yoneda fail to teach applying the laser beam in a nitrogen atmosphere. However, Hoga (Figs.2A-2B) in a related method to form a crystalline semiconductor structure teach forming a semiconductor film (13); and applying a laser in a nitrogen atmosphere to form a crystalline semiconductor film (14) (column 2, lines 53 – 61). Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention was made to apply a laser beam in a nitrogen atmosphere as taught by Hoga in the crystalline semiconductor formation method of Funai et al. and Yoneda, since this would result in the formation of a polycrystalline region in an inert atmosphere (column 2, lines 53 – 61), thus reducing impurities in the system.

4. Claims 19-26 are rejected under 35 U.S.C. 103(a) as being unpatentable over Funai et al. (U.S. 6,162,667) in view of Asai et al. (U.S. 5,365,875).

Funai et al. (Figs.19A-D) in a related method to form a crystalline semiconductor film structure teach forming a semiconductor film (1302) over a substrate (1301, 1300); cleaning a surface of the semiconductor film (1302) by using HF aqueous solution; preheating said semiconductor film (1302) in an oxygen environment to form an oxide film (1303), wherein the oxide film has a thickness of 20 Å; and applying a linear laser beam to said semiconductor film to form a crystalline semiconductor film (1302a), said

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laser beam applied at an energy density of 200 to 400 mJ/cm² (column 44, line 41 – column 45, line 48). However, Funai et al. fail to teach applying the laser beam to form the crystalline semiconductor film in the air. However, Asai et al. (Figs.2a-2d) in a related method to form a crystalline semiconductor film teach applying a laser beam to a semiconductor layer 2, forming a crystalline semiconductor layer (2') in the air (column 10, line 20 – column 11, line 3). Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention was made to form the crystalline semiconductor layer as taught by Asai et al. in the crystalline layer formation method of Funai et al., since this would result in an improved crystallinity of the semiconductor layer (column 10, lines 41 – 60).

Conclusion

5. Papers related to this application may be submitted directly to Art Unit 2823 by facsimile transmission. Papers should be faxed to Art Unit 2823 via the Art Unit 2823 Fax Center located in Crystal Plaza 4, room 3C23. The faxing of such papers must conform to the notice published in the Official Gazette, 1096 OG 30 (15 November 1989). The Art Unit 2823 Fax Center number is **(703) 305-3432**. The Art Unit 2823 Fax Center is to be used only for papers related to Art Unit 2823 applications.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to **Julio J. Maldonado** at **(703) 306-0098** and between the hours of 8:00 AM to 4:00 PM (Eastern Standard Time) Monday through Friday or by e-mail via julio.maldonado@uspto.gov. If attempts to reach the examiner by telephone

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are unsuccessful, the examiner's supervisor, Olik Chaudhuri, can be reached on (703) 306-2794.

Any inquiry of a general nature or relating to the status of this application should be directed to the **Group 2800 Receptionist** at **(703) 308-0956**.


Julio J. Maldonado

Patent Examiner

Art Unit 2823

703-306-0098

julio.maldonado@uspto.gov


George Pourson
Primary Examiner
2823